USER MANUAL

HUBLiON

LITHIUM

IRON PHOSPHATE

BATTERY

LITHIUM

IRON PHOSPHATE

BATTERY

CONTENTS

SAFETY

Section 1

Always wear personal protective equipment when handling batteries.

Use lift straps or handles when carrying or moving batteries.

Fuse all circuits connected to the battery.

Do not short circuit the battery, always check for correct polarity.

Do not place on a metal surface.

Keep away from heat, sparks or open flames.

Use only properly sized conductors or cables.

Do not use mismatched batteries in the same circuit.

Allow for air circulation around the battery.

Do not handle batteries with cables connected or in use.

Utilize hand tools with non conductive handles.

Do not over or under torque terminal bolts.

INSTALLATION

Section 2

A **Equipment**
Properly sized tools, with non conductive handles, Personal protective equipment and Voltmeter.

B **Location**
Install in a well ventilated area, allow minimum clearance of 1". Select a location that avoids direct sunlight. Battery life is extended when operating between 0°C and 40°C, with 20°C being optimal. Preference is to orient battery terminals upright (side

is permitted), and secured with a non conductive hold down.

C **Cable Size**
Size cables appropriately, based on amperage and length of cable. Allow a margin of safety when sizing cables. Reduce length of run, to the extent possible. When connecting cables, always double check polarity is correct, before final connection.

D **Always ensure proper torque values.** Under torque will result in high resistance, overheating, and will damage terminal and cables Over torque will result in damaging the terminal. Torque errors are not a warrantable item.

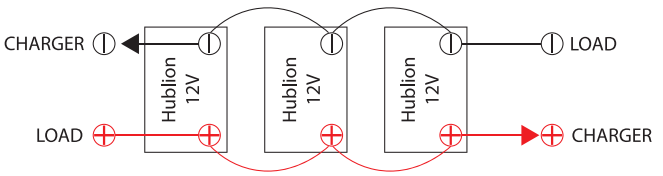
Torque Settings:

Terminal Size	Value
M5	6.2N*m
M6	8.5N*m
M8	12.4N*m

E

Installing a shunt based battery monitoring is recommended, as lithium has very little voltage sag as the battery discharges. Having a battery monitor will show the state of charge to the user.

F **Parallel Connections**
Up to 20 batteries can be connected in parallel. Use equal cable lengths and consistent gauge sizing. Always ensure each battery is within 50 mV (0.05V) before installing. Ensure all batteries are the same make, model and size when connecting. See drawing below showing parallel, load and charger connections.



G Series connections should only be done when needed. Preference is given to paralleling of desired voltage. Example: 12V batteries in parallel, 24V batteries in parallel or 48V batteries in parallel. Always ensure each battery is witin 50 mV (0.05V) before installing. Ensure all batteries are the same make, model and size when connecting.

CHARGING

Section 3

A **When to charge your battery**
When the state of charge is below 10% remaining or (90% DOD), charge right away. Charging frequently does not reduce the battery's cycle life.

B Traditional lead battery chargers may be used, provided they operate within the voltage and amperage parameters. It is optimal to have a charger with a specific lithium charge algorithm.

C For optimal life, charge at 50% of batteries rated amp hour capacity or less.Example: 100 amp hour battery, should be charged a 50A or less for optimized life.

D For charging algorithms, preference is to utilize a specific Lithium setting. In the absence of a lithium setting, often a Gel or AGM setting will work.

E When charging from an alternator, it is advisable to use a DC to DC charger, to limit the amperage and voltage as needed. Not limiting the current, can result in alternators overheating, as they put out full amperage for extended periods of time. In addition some DC to DC chargers will have programmable lithium charge algorithms built in.

F Installing a shunt based battery monitor is recomended, and will record all current going into or out of the batteries, and display state of charge.

G Refer to spec sheets for charge voltage settings
12.8V Bulk/Absorption @ 14.5 – 14.6V, float @ 13.7V
25.6V Bulk/Absorption @ 29.0 – 29.2V, float @ 27.4V
51.2V Bulk/Absorption @ 58.0 – 58.4V, float @ 54.8V
Inverter/Chargers, battery chargers and solar charge controllers should utilize the above settings.

H Avoid installation of temperature sensors or using temperature compensation.

I Lithium batteries do not require external equalization charging.

J Charge when batteries are between 0°C and above, unless a battery heating circuit is integrated into the battery.

K Integrated heating circuits are available, and will warm the battery to 0°C or 32°F, and only then will the battery begin to accept a charge for replenishing the battery.

L Charge to a minimum of 50%, and a maximum of 80% state of charge for storage purposes. Additional charging every 90 days will ensure a minimum 50% state of charge is maintained

M Float charging is not a requirement

DISCHARGING

Section 4

A Our lithium batteries can be safely discharged at temperatures ranging from (-20°C to 60°C or -4°F to 140°F). Batteries are protected for over temperature.

B A discharge of 80% to 90% or less DOD is recommended.

C Battery will self discharge approximately 3% per month.

D Leaving the battery at zero percent state of charge, for extended periods, will cause permanent damage.

BMS / OPERATION

Section 5

A BMS – Battery Management System is designed to ensure the battery operates within the specified parameters. The BMS is integrated into each of our HUBLiON batteries.

B BMS protects against interim under voltage, overvoltage, over current, and over temperature.

C In the event of a BMS disconnect, it may be necessary to disconnect the load and or recharge with a specific recovery charger having a lithium charge algorithm.

D Avoid short circuits at all times, when connecting and disconnecting cables and chargers.

INSPECTION

Section 6

A Ensure the DC cables are not contaminated or corroded in any way

B Ensure correct terminal torque settings

C Inspect battery hold downs are secured

D Ensure area around batteries is clear and clean, allowing air circulation

STORAGE

Section 7

A Disconnect batteries from all loads and charging sources when placing into storage.

B Storing at 50% to 80% depth of discharge is recommended.

C Storing at room temperature (21°C to 25°C) is recommended in the off season or idle times.

D Batteries will discharge approximately 3% per month.

E For long term storage complete a full charge and discharge every 6 months.

TERMINOLOGY

A DOD = Depth of discharge

B BMS = Battery Management System

C SOC = State of Charge

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